(19) Canadian Intellectual Property Office
An Agency of Industry Canada

Office de la Propriété Intellectuelle du Canada
Un organisme d'Industrie Canada

(11) CA 2 261 552 (13) A1
(43) 17.08.1999

(12)

(21) 2 261 552

(51) Int. Cl.[6]: H04L 012/18

(22) 10.02.1999

(30) 9803205.5 GB 17.02.1998

(71)
MITEL CORPORATION,
P.O. Box 13089
350 Legget Drive, KANATA, O1 (CA).

(72)
PERES, Eliana M. O. (CA).
PINARD, Deborah L. (CA).

(74)
Marks & Clerk

(54) CONFERENCE D'EGAL A EGA
(54) PEER TO PEER CONFERENCING

(57)

A peer to peer communication architecture for setting up multi-party conference connections through distributed workstations linked by a broadband backbone is described. Each workstation, whether a desktop, proxy PC or gateway to the PSTN is agent-controlled to set up and tear down conference connections without central call processing. Terminals for voice communications are associated with the workstations and call grouping to selected ones of these terminals is controlled by connection management software located in the workstations.

OPIC
Office de la propriété intellectuelle du Canada

CIPO
Canadian Intellectual Property Office

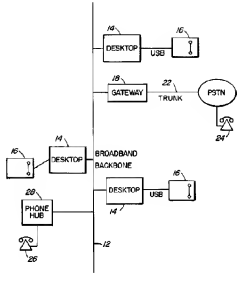
(12) (19) (CA) **Demande-Application**

(21) (A1) **2,261,552**
(22) 1999/02/10
(43) 1999/08/17

(72) PINARD, Deborah L., CA
(72) PERES, Eliana M. O., CA
(71) MITEL CORPORATION, CA

(51) Int.Cl.[6] H04L 12/18
(30) 1998/02/17 (9803205.5) GB

(54) **CONFERENCE D'EGAL A EGA**
(54) **PEER TO PEER CONFERENCING**



(57) A peer to peer communication architecture for setting up multi-party conference connections through distributed workstations linked by a broadband backbone is described. Each workstation, whether a desktop, proxy PC or gateway to the PSTN is agent-controlled to set up and tear down conference connections without central call processing. Terminals for voice communications are associated with the workstations and call grouping to selected ones of these terminals is controlled by connection management software located in the workstations.

Abstract

A peer to peer communication architecture for setting up multi-party conference connections through distributed workstations linked by a broadband backbone is described. Each workstation, whether a desktop, proxy PC or gateway to the PSTN is agent-controlled to set up and tear down conference connections without central call processing. Terminals for voice communications are associated with the workstations and call grouping to selected ones of these terminals is controlled by connection management software located in the workstations.

PEER TO PEER CONFERENCING

Field of the Invention

This invention relates to a communications system and more particularly to an agent-based, peer to peer communications system for setting up conference connections over a broadband network without employing central call processing control.

Background

It is well known to set up multi-party conference connections through a central office or a PBX switch utilizing controlling software located at the central office or in the PBX switch. It is also known to set up conference connections over the switch fabric of an asynchronous transfer mode (ATM) network. In these prior art systems some form of dedicated conferencing bridge or controlling software is required.

It is an object of the present invention to establish a conferencing connection between multiple stations over the broadband network without involving any dedicated hardware or software. This is achieved by employing an agent-based

architecture.

An agent is considered to be a background process that performs some action when an event occurs. A peer to peer architecture is an operating system that permits users at separate locations to share the resources on their computers and to access shared resources on other computers. In a peer to peer system each computer has the same status in a network of computers. Thus, in an agent-based, peer to peer architecture agents located within computers or other network elements connected to networks such as a wide area network (WAN), a local area network (LAN), or Internet interface with agents at other workstations to carry out a desired goal or activity. In the present invention this goal or activity is the setting up and tearing down of conference connections between multiple parties each operating their own workstation and having an audio path to a compatible telephone or similar device.

In U.S. Patent 5,638,494 that issued June 10, 1997 to Pinard et al, and assigned to the assignee of the present invention an agent based peer-to-peer communications system is described. In the subject patent considerable detail respecting device agents, command goals and process agents are provided and specific reference may be made thereto for a greater understanding of these elements. The contents of

US Patent 5,638,494 are incorporated herein by reference. In general, however, the '494 patent defines an agent as a physical entity which can accept a process goal or goals and produce an outcome. That outcome may be another process goal or set of goals.

The present invention utilizes the agent-based peer to peer architecture to establish conference connections between three or more terminals by establishing and implementing process goals within distributed workstations.

Summary of the Invention

Therefore, in accordance with a first aspect of the present invention there is provided in a peer to peer communication architecture, a system for setting up conference connections comprising; a plurality of agent-controlled work stations interconnected through a network wherein each work station has a terminal for voice communication; a plurality of agents for receiving, storing and implementing communication control goals; and connection management means to controllably set up communication connections between selected work stations via the network.

In accordance with a second aspect of the present invention there is provided a method of setting up

conference connections via a peer to peer communication system comprising: a) providing a plurality of work stations each having an associated terminal for voice communications; b) providing a plurality of process agents within each work station, the process agents for receiving process commands and for implementing the commands; c) providing connection management means within the work stations to controllably set up communications connections respecting selected work stations and d) interconnecting the work stations for setting up conference connections between selective terminals.

Brief Description of the Drawings

The invention will now be described in greater detail with reference to the attached drawings wherein:

Figure 1 is a high-level block diagram of the peer to peer communication architecture according to the present invention;

Figure 2 illustrates the process agents within each workstation;

Figure 3 illustrates the connection management scheme within a workstation;

Figure 4 illustrates a three-way connection without

conferencing;

Figure 5 graphically illustrates the agent-controlled connection setup;

Figure 6 illustrates a three-way connection with conferencing.

Detailed Description of the Invention

Figure 1 illustrates a general overview of an exemplary peer to peer communication architecture according to the present invention. As shown, the system includes broadband backbone 12 to which a plurality of workstations is connected. These workstations may include desktop units 14, which in a preferred embodiment are computers such as PCs, having a phone 16 connected thereto via a universal serial bus (USB). It is also contemplated that the phone could be a Phoneblaster (TRADEMARK) or any other terminal that permits voice to be carried over the broadband backbone.

The system may also include network elements such as gateway 18 which provides access to the public switched telephone network (PSTN) via trunk 22 and a standard telephone or plain old telephone service (POTS) 24. The network may also include a stand-alone phone 26 connected to the backbone by a phone hub which may be a proxy PC.

As shown in Figure 2 each workstation within the peer to peer architecture includes a number of process agents specifically intended to implement required goals. As shown, each workstation PC 14 includes a role agent 30, a desktop controller agent 32, a connection agent 34 and a view handling agent 36. Each of these agents interface with counterpart agents in other workstations connected to the network to share resources and complete goals. Phone hub 28 includes the same agents as workstation 14 with the exception of the view-handling agent 36 which is not required by the hub 28. The same agents as located in hub 28 are found in gateway 18. These agents control the communication system in a manner as set out in the aforementioned US patent. These entities provide the communication control in a peer to peer fashion and replace the standard centralized call processing element of a PBX or central office. In addition to the aforementioned agents each workstation includes the appropriate operating software as well as any required data storage apparatus such as random access memories (RAM).

Figure 3 shows details of the connection management protocol. Each PC 14 or network element has a unique IP address (X for example). Connection management software 40 interfaces with connection agent 34 in each workstation and

has the responsibility for connecting the desktop audio path 42 (to telephone 16, for example) to a virtual channel 46 linked to a designated workstation. Connection management software 40 is also responsible for connecting appropriate tones to the virtual network channels for alerting users at designated workstations of an incoming connection. As shown, the virtual channel 46 is connected to the broadband backbone 12.

Figure 4 illustrates the initial setup of a multiple party communication link before a conference is requested. In this setup desktop A has established connections with desktops B and C. Connection A-B shown by dotted line 48 traverses switch hub 50. Similarly, the A-C connection shown by dashed line 52 also traverses hub 50. In this configuration when A is talking to B, C is on hold. This means that in A's connection control the virtual channel between A and B is connected to A's desktop audio and C's virtual channel in A is connected to local music or simply receives silence. B and C know nothing of each other and only have their connection to A set up. In the case of a stand-alone phone or a network connection there is a proxy PC doing all of this for the trunk or phone.

Figure 5 shows the complete message flow when A wants to include C as a conference participant in a call with B.

This requires that a connection be established between B and C and that each end is responsible for handling its own call.

The series of messages numbered sequentially by circled numbers 1-19 are as follows: the view-handling agent in A sends a message requesting a conference setup between A, B and C to A's desktop controller. A's desktop controller passes this message to A's role agent which in turn passes the message to B's role agent. B's role agent passes the message down to its desktop controller which establishes a virtual channel for C through its connection agent. B's desktop controller agent also sends an acknowledgement back to B's role agent. If for some reason it cannot set up a conference then a negative acknowledgement will be sent all the way back and the attempt will fail. B's role agent sends the conference request message to C's role agent which then sends a message to C's desktop controller agent, gets a virtual channel for B through its connection agent and sends an acknowledgement back to C's role agent. When the role agent in C gets the acknowledgement from its desktop controller it realizes that it is the last agent in the chain so that the conference can be successful. The role agent in C then sends an acknowledgement back down to complete the conference which causes C's desktop controller

to tell its view-handler agent to update the call to include a new party. The connection agent then sets up a mixed connection from A and B. The role agent in C also passes the acknowledgement back to the role agent in B which passes this acknowledgement down to B's desktop controller agent as previously discussed. B's desktop controller agent sends a message to B's view-handling agent and also sends a message to the connection agent in B to establish the conference between A and C. B's role agent then sends an acknowledgement to A's role agent which in turn passes the acknowledgement down to A's desktop controller agent which notifies A's view-handling agent and the connection agent. This establishes a connection situation as shown in Figure 6 wherein the connection management software in each end station has set up a virtual channel to each other. The connection control in each end station is broadcasting the voice packets to the two other end stations and also mixing the voice packets coming in from the other two. This means that each end is totally independent of each other and B and C can stay in a conversation even if A drops out. Thus, in Figure 6 the A-B connection is by dotted line 54, the A-C connection is by dashed line 56 and the B-C connection is by solid line 58.

If a fourth or additional parties are to be added to

the connection the message flow as shown in Figure 5 is increased to include a fourth similar chain. The same holds true if additional parties are to be added.

The present invention provides a cascading method of setting up a conference connection so that if it fails at any point it can degrade gracefully.

While a particular embodiment of the invention has been described and illustrated it will be apparent to one skilled in the art that numerous changes can be made to the basic concept. It is to be understood, however, that to the extent possible such changes will fall within the scope of the invention as defined by the appended claims.

CLAIMS

1. In a peer to peer communication architecture, a system for setting up conference connections comprising:
a plurality of agent-controlled work stations interconnected through a network wherein each work station has a terminal for voice communication;
a plurality of agents for receiving, storing and implementing conference connection goals; and
connection management means responsive to conference connection goals to controllably set up communication connections between selected work stations via said network.

2. A system as defined in claim 1 wherein said agents in said work stations include a role agent, a desktop controller agent and a connection agent.

3. A system as defined in claim 1 further including a view handling agent.

4. A system as defined in claim 2 further including a view handling agent.

5. A system as defined in claim 3 wherein said connection agent interfaces with connection management

software to selectively connect said terminal to said network.

6. A system as defined in claim 4 wherein said connection agent interfaces with connection management software to selectively connect said terminal to said network.

7. A system as defined in claim 5 wherein said connection management software interfaces with a tone generator in said work station to selectively provide an alerting tone.

8. A system as defined in claim 7 wherein said connection management software in one of said work stations interfaces with said terminal and said network to broadcast a stream of audio packets from said one work station to selected ones of the remaining work stations.

9. A system as defined in claim 7 wherein said connection management software in one of said work stations controls said connection agent to mix streams of audio packets received from other work stations for delivery to said terminal associated with said one work station.

10. A method of setting up conference connections via a peer to peer communication system comprising:

a) providing a plurality of work stations each having an associated terminal for voice communications;

b) providing a plurality of process agents within each work station, said work stations for receiving process commands and for implementing said commands;

c) providing connection management means within said work station to controllably set up communication connections respecting selected work stations; and

d) interconnecting said work stations via a network backbone for setting up conference connections between selected terminals.

11. A method as defined in claim 10 wherein said process agents comprise view handling agents, desktop control agents, role agents and connection agents, said connection agent interfacing with connection management software to selectively connect said terminal to a virtual connection through said network.

12. A method as defined in claim 10 wherein said conference connection is set up between first, second and third work stations, the process agents within said first work station co-operating with each other and with process

agents in each of said second and third work stations to selectively interconnect said first, second and third terminals over the network backbone.

13. A method as defined in claim 11 wherein said conference connection is set up between first, second and third work stations, the process agents within said first work station co-operating with each other and with process agents in each of said second and third work stations to selectively interconnect said first, second and third terminals over the network backbone.

14. A method as defined in claim 12 wherein said conference connection is set up between four or more work stations.

15. A method as defined in claim 13 wherein said conference connection is set up between four or more work stations.

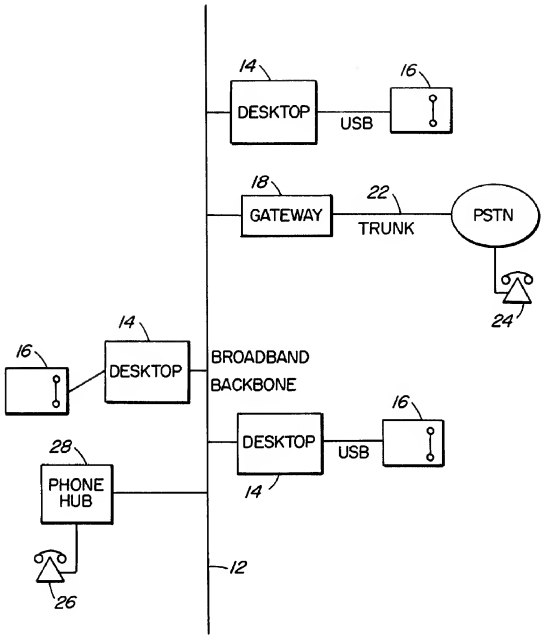


FIG. 1

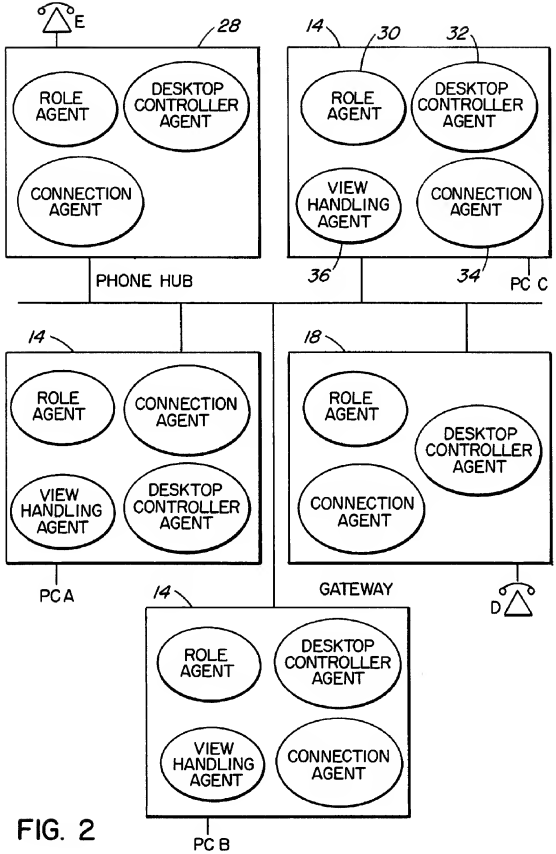


FIG. 2

Marks & Clerk

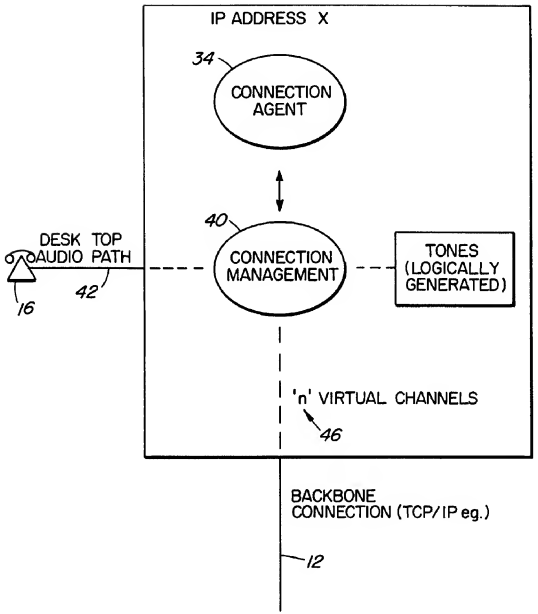


FIG. 3

Marks & Clerk

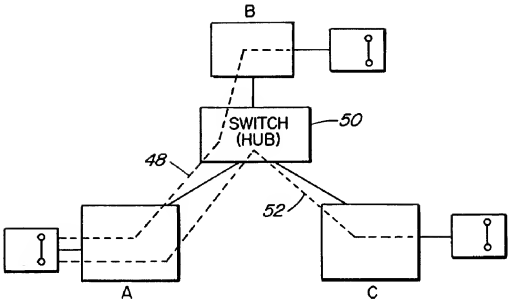


FIG. 4

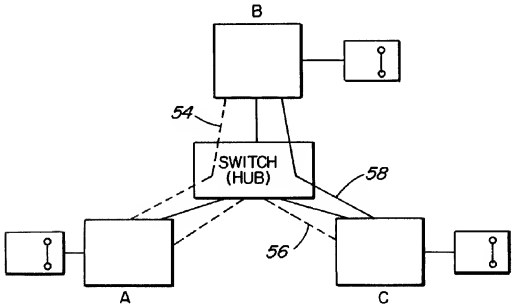


FIG. 6

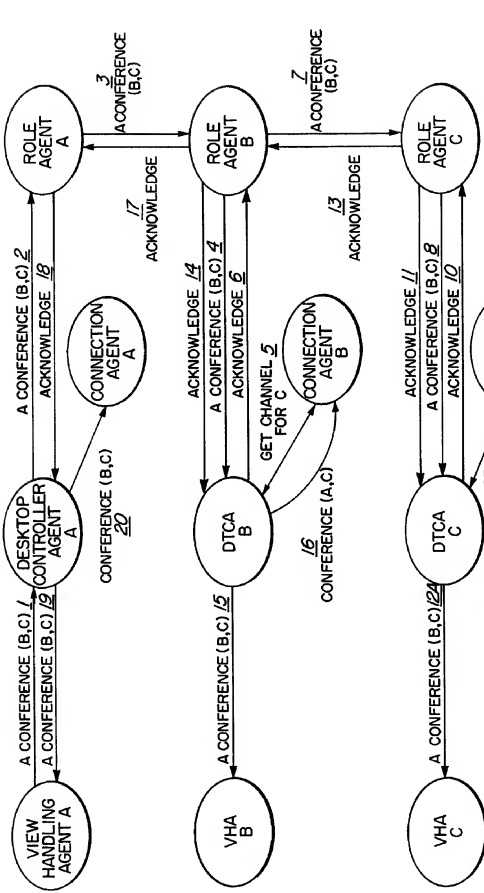


FIG. 5

Marks & Clerk